heated, and not decomposable by mere heat. It had no taste, no smell; it did not seem to be soluble in boiling water, nor even in muriatic, nitric, or sulphuric acid; neither did strong lixivium of caustic potash appear to produce the least effect; and the only processes by which it appeared to be affected were combustion, or the action of fused potash. In the latter case it emitted a smell of ammonia; it appeared to dissolve in the potash, which then gave indication of the acids that had entered into the composition of this singularly intractable substance.

Amongst the known combustibles, it is observed that charcoal is the only one which does not combine directly with oxymuriatic acid gas; but Mr. Davy is of opinion that it does in some cases unite by the medium of hydrogen, as in the state of olefiant gas, and in the formation of muriatic ether. The author expresses a hope that new and more correct views of the composition of muriatic salts will facilitate their decomposition, and explain, in a satisfactory manner, various economical processes, long since practised, for obtaining the acid from common salt by means of aluminous or siliceous substances, the success of which has in general depended on the accidental presence of moisture. In this case the alkali forms a glass, and is rendered useless; but by the substitution of iron filings, and passing steam over the mixture when heated, Mr. Davy has succeeded in separating a portion of soda from common salt.

Observations upon Luminous Animals. By J. Macartney, *Esq. Communicated by* Everard Home, *Esq. F.R.S.* Read May 17, 1810. [*Phil. Trans.* 1810, *p.* 258.]

Although the property of emitting light, which is possessed by some animals, has appeared interesting to naturalists of all ages, and although many detached memoirs have been written upon the subject, the author observes that the history of these animals is still extremely imperfect; and he endeavours to supply the defect by enumerating all the different animals which, to his knowledge, possess that property, and to ascertain, by dissection or otherwise, the parts of their bodies from whence the light issues, and, by experiment, to discover the circumstances necessary or accessory to the emission of light.

The genera in which individuals certainly luminous are to be found are as many as twelve in number. There is one species of Pholas amongst the mollusca. Among insects are seven genera; Elater, Lampyris, Fulgora, Pausus, Scolopendra, Cancer, and Monoculus. Among the worms is one, Nereis. And in the class of zoophytes, the three genera of Medusa, Pyrosoma, and Pennatula.

The same property has also been ascribed to various kinds of fish; but, in the author's estimation, they have probably acquired that reputation by occasionally evolving light after death.

It has also been said, that the *Lumbricus terrestris*, or common earth-worm, has been found to be luminous for several days together;

but it does not seem probable that such a property (if it existed) could be overlooked in an animal so extremely common.

The luminous property of the *Pholas dactylus* was observed by Pliny to be communicated to the hand that touched it; and this has been confirmed by Reaumur.

Of the genus Elater there are three species luminous, one of which, the *noctilucus*, is so brilliant, that it was employed by the South American Indians for the purposes of illumination.

In the genus Lampyris there are many species, at the head of which is the *Lampyris noctiluca*, or common glow-worm, which may serve as a specimen of the manner in which the light is produced by the rest. In this species the light lasts only during the breeding season; and as it is confined to the female insect, it would appear to answer the purpose of guiding or inviting the male. But it has been observed by Montbeillard, that the eggs are also occasionally luminous; and Mr. Macartney confirms this observation, as he once saw a quantity of them shine unremittingly for several days together.

Of the genus Fulgora, only three have been particularly noticed for the light they yield,—the *lanternaria*, *candelaria*, and *pyrorhynchus*; although it is probable, from their structure, that many others of the genus possess this property.

The Pausus is remarkable only for the situation of its light, which is carried at the extremity of its antennæ.

The *Scolopendra electrica* is not uncommon in this country; and yet the light has not often been observed. According to the author's observation, the light is communicated, and remains visible for some time on a hand that has touched it; and, in one or two instances, insects which had been long confined from the light did not appear luminous, but acquired this faculty after being for some time exposed to daylight.

The *Cancer fulgens* was discovered by Sir Joseph Banks, who observed that its whole body was illuminated, and produced very vivid flashes of light.

Of the Monoculi, the author reckons three species that are luminous; one discovered by Godeheu de Riville, and two by Capt. Horsburgh.

With respect to the *Nereis noctiluca*, to which the light of the sea has been ascribed by Vianelli, Griselini, Spallanzani, and others, in various parts of the Mediterranean, and by Adleo in the African and Indian oceans, the author is of opinion that it never appears on the coasts of this country, and that the light of the sea, which we most frequently witness, is caused by Medusæ.

Of these, the largest is the *Medusa pellucens*, discovered by Sir Joseph Banks, along with the *Cancer fulgens*, in his voyage with Capt. Cook between Madeira and Rio de Janeiro. This is six inches in diameter. The *noctiluca* described by Taskal is three inches in diameter.

Another Medusa was discovered by Spallanzani in the Straits of Messina: it is said to be as bright as a torch, and visible at the depth

of thirty-five feet below the surface of the sea. As this light occasionally disappears entirely, and reappears after a considerable interval, Spallanzani supposed the animal to be luminous only when in motion, and that the cessation depends upon its being at perfect rest.

The *Pyrosoma Atlanticum*, discovered by Peron, seems confined to certain latitudes, and its light, like that of the former, is supposed to be visible only during motion.

Mr. Macartney has himself discovered one Beroe not before observed, and two Medusæ, unless one of the latter be, in fact, the *Medusa hemisphærica* of Gronovius and of Muller, who did not perceive it to be luminous. The second Medusa, from its extreme minuteness and brilliancy, he calls *Medusa scintillans*: on account of its smallness it cannot be separated from the water but by straining through a cloth. When a small number of them are put into clear water, it is difficult to distinguish them while separate, on account of their minuteness and transparency; but as they gradually collect at the surface of the water, they then appear together of a dusky straw colour.

It is to this species of Medusa that the author is inclined to ascribe many phenomena of illumination of large portions of the sea which have been described by navigators.

In some instances the sea has been compared to a plain of snow. Capt. Horsburgh saw it of an uniform white colour, like milk, on the Malabar coast, and says it has frequently that appearance in the Banda Sea. The same was observed by Mr. Langstaffe in a voyage from New Holland to China; and it was ascertained by him to arise from numerous minute bodies of the size of small pins' heads, which, when lifted out of the water by adhering to the hand, were found connected together as a chain.

At Margate the author has seen these in great abundance; and in certain parts of Milford Haven they are generally so numerous, that on one occasion he separated, by straining, a pint of Medusæ from a gallon of the water.

Mr. Macartney next examines the particular structure of those insects which possess distinct organization for the production of light; as, the various species of Lampyris, Elater, Fulgora, and Pausus.

The light of the genus Lampyris resides generally in the last rings of the abdomen. In the common glow-worm these rings are very transparent, and there is diffused over their internal surface a yellowish substance that has been compared to paste; but the author observes that the matter is organized. He also remarks, that in the last ring of the abdomen there are two small sacs that emit a light brighter than the rest, and apparently less under the control of the will, as it is more permanent.

In the *Elater noctilucus* and *Elater ignitus*, there is a similar soft yellowish substance underneath the corselet. But in those of the genus Fulgora, which the author has had opportunities of examining, this peculiar matter was not distinctly observable.

In none of these animals could Mr. Macartney discern that the luminous organs were supplied either with nerves, or with air tubes, better than other parts of their bodies.

With the exception of these insects, in which the light is confined to particular parts, the exhibition of light appears to the author to depend on the presence of a fluid matter diffused throughout the whole body of the animal.

By squeezing the fluid of two large Medusæ into a glass of well-water, it was rendered luminous for nearly an hour and a half. Agitation also occasioned a fresh appearance of light after that period, and even after agitation ceased to produce any effect, an increase of temperature rendered it again luminous for a short time.

Since the phenomena of animal light have been attempted to be explained in various ways by different authors, and since their experiments are in many respects at variance with each other, the author adds a series of experiments of his own, from which he draws his own conclusions.

A glow-worm lived, and emitted light, nearly two hours in a glass of water, though thus confined from oxygen.

The luminous substance, after being extracted from glow-worms, gave no light.

The luminous sacs, on the contrary, after having been cut out from the tail of the glow-worm, continued to emit light several hours in the atmosphere; and when put into water the power was prolonged to forty-eight hours.

By application of heat they were not rendered more luminous, and had no tendency to active combustion, like phosphorus.

The luminous part of the glow-worm appeared to raise a delicate thermometer, somewhat more than other parts of its body; but of this fact the author is not confident: but when the luminous sacs had been separated from the body of the animal, these had no effect on the thermometer, though they continued to emit light.

By heating some water containing Medusæ, the brilliancy of their light was very much increased; but they were killed in less than a minute.

Some of the same Medusæ, being put into spirits of wine, emitted immediately a strong light, which continued till they died.

The *Medusa scintillans*, or *hemisphærica*, being put under the receiver of an air-pump, in a vessel of water, continued to emit light, notwithstanding complete exhaustion of the air.

A Medusa, upon being electrified by sparks from an electric machine, was not excited to give out light. But when shocks were transmitted through a collection of *Medusæ hemisphæricæ*, they were excited, and shone with great brilliancy.

From these experiments, says the author, it appears that the luminous substance is by no means of the nature of phosphorus, as it often shows the strongest light when excluded from oxygen gas; and so far from undergoing any process of combustion, it is incapable of being inflamed; that the increase of heat during the shining of glow-

worms is merely an accompaniment, not an effect of the phenomenon; and that heat and electricity act merely like other stimuli upon the vital powers of the animal.

Observations and Experiments on Pus. *By* George Pearson, *M.D. F.R.S.* Read July 5, 1810. [*Phil. Trans.* 1810, *p.* 294.]

The author prefaces the account of his experiments and observations on the nature and properties of purulent fluids, by an etymological disquisition concerning the origin of the word *Pus*, and the various senses which philologists may discover for the word πυος, besides the distinct signification given to it by Hippocrates, of a thick, white, inodorous, uniformly smooth fluid, which is contained in an abscess. From the etymology, Dr. Pearson next proceeds to the history of the several opinions that have been entertained respecting the formation of purulent matters, and of the characters by which different persons have endeavoured to distinguish real pus, from such purulent fluids as ought rather to be considered as modifications of mucus. Since nothing appears to have been added since the date of Mr. Home's dissertation on pus, which was written in the year 1798, Dr. Pearson's history concludes with an outline of Mr. Home's account of the nature of pus. According to him, pus is composed of globules swimming in a transparent aqueous fluid. The globules, on which its opacity depends, are formed subsequently to the secretion of the transparent fluid. They are not soluble in cold water, like those of blood, but are decomposed by boiling water; and the fluid in which they swim is not coagulable by heat, as serum, but is coagulable by sal-ammoniac, which does not coagulate serum.

Dr. Pearson's examination of pus is divided into six sections, of which the first treats of the simple and obvious properties; and he distinguishes four different kinds of pus.

1. The cream-like and equally consistent.
2. The curdy of unequal consistence.
3. The serous, or thin kind.
4. The thick, viscid, or slimy.

Of course, as he examines, under the name of pus, fluids so different from each other, he obtains results which differ accordingly in the qualities and quantities of their ingredients.

In the second section the agency of caloric is observed.

According to the author, all kinds of pus are coagulated between 160° and 165° of Fahrenheit. By continued heat the water is evaporated, and there remains a dry brittle mass, amounting to about one seventh or one eighth of the original weight. By exposure to greater heat in a crucible of platina, the greatest part of this residuum was consumed, and there remained only the salts of the serum fused together, and amounting to $\frac{1}{250}$th, $\frac{1}{300}$dth, or $\frac{1}{400}$dth, of the original quantity of pus employed.

These, says the author, consisted chiefly of muriate of soda, phosphate of lime, potash, with strong indication of carbonate of lime,